as this was not telegraphed home at the time, and why no confirmation has been received from other sources.

"*Cape Town, November* 5 (*viâ Plymouth*).

"Mr. Eddie, F.R.A.S., reports from Grahamstown that a comet was seen at 7.45 p.m. on the 27th ult., and observed until 8.32 p.m., when the last trace faded in the south-eastern heavens. It travelled from nearly due west around the western and southern horizon at an altitude from about 20° to 25°, and disappeared in the south-east, performing during that very brief interval a journey stretching over at least 100°. It was at its longest fully 90° in length, while in width it did not exceed half a degree, except where it became very faint and slightly spread out at its posterior extremity, and where there were also faint indications of lateral division. The preceding portion was a point in cometary form, but no nucleus could be discerned.

"When first seen, it was inclined at an angle of about 45° towards the south, and was about 30° in length, but as it moved southward it became almost parallel to the horizon, with an altitude of about 20°, till it stretched along the southern horizon an enormously long, narrow, almost parallel, weird-looking riband of gray light moving visibly across the sky. It passed over several bright stars, notably α Centauri and β Argo Navis, but did not appear to dim their lustre. The moon was at the full."

THE STARS 121 AND 483 BIRM.—Mr. Backhouse informs us that these irregular variable stars now appear to be near their maxima. He says:—"They are two of the most splendid red stars that are visible in a moderate-sized telescope; 483 is the deepest-coloured star that I am acquainted with of anything like its brightness, with the exception of R Leporis; 121 is usually nearly as deep, but at present seems not so red as usual." Dunér has described the spectrum of each as Group VI. (Class III.*b*), but, as pointed out by Mr. Backhouse, it is possible that there may be variations with the maximum of luminosity, especially as one of them appears to have changed colour. The positions of the stars are 5h. 39m. 6s., + 20° 39′, and 18h. 58m. 32s., − 5° 51′ respectively.

APEX OF THE SUN'S WAY.—In *Astronomische Nachrichten*, Nos. 2999, 3000, Oscar Stampe gives an extended investigation into the position of the apex of the sun's way. The following are the numbers and groups of stars considered, and the values obtained:—

	Number of Stars.	Yearly Proper Motion.	Co-ordinates of Apex. R.A.	Decl.
Group 1	551	0″·16 to 0″·32	287°·4	+42°·0
,, 2	340	0·32 to 0·64	279·7	+40·5
,, 3	105	0·64 to 1·28	287·9	+32·1
,, 4	58	1·28 and over	285·2	+30·4
		Mean	285°·0	+36°·2

This agrees well with the values found by Boss (*Astronomical Journal*, 213), viz.:—R.A. 280°, Decl. +40°, and does not differ considerably from Struve's values, viz.:—R.A. 273°·3, and Decl. +27°·3, or +37°·7, if Boss's correction be applied. The position of the apex may therefore be taken as somewhere near Vega.

ORBITS OF 61 CYGNI, CASTOR, AND 70 OPHIUCHI.—In the November number of the *Sidereal Messenger*, Mr. N. M. Mann discusses the orbits of these three interesting binaries. The period of 61 Cygni is shown to be 462 years. If this be so, then, taking the parallax of the binary as 0″·55, the mass of the system is 1·45 times that of the sun. In a previous note (*Sidereal Messenger*, vol. ii. p. 22) the author found a period of 1159 years, whilst the combined mass of the connected bodies was concluded to be only one-seventh the sun's mass. New orbits have been calculated for Castor and 70 Ophiuchi. The latter star has made an entire revolution since the first good observation, hence it is probable that the elements computed are correct, and that the places given may be relied upon for many years.

TWO NEW COMETS (*e* AND *f* 1890).—Dr. Copeland announces, in *Edinburgh Circulars* Nos. 10 and 11, the discovery of a rather bright comet, by Prof. Zona, at Palermo, on November 15, at 10h. 24·1m. local time. Its position then was R.A. 5h. 35m. 54·8s., Decl. N. 33° 23′; daily motion *minus* 5m. 32s., and *plus* 17′. This comet was observed at Kiel on the following day at 9h. 1·1m. in R.A. 5h. 30m. 46·3s., and Decl. N. 33° 37′ 6″.

Dr. Spitaler discovered a faint comet, not identical with the above, at Vienna, on the 16th inst., its place at 16h. 32m. local time then being R.A. 5h. 27m. 16·93s., Decl. N. 33° 37′ 16″. It was in the constellation Auriga, and moving slowly towards the north-east, like Zona's comet.

THE STAR D.M. + 53° 2684.—The Rev. T. E. Espin announces (*Wolsingham Circular* No. 28) that this star, 710*a* in the Espin-Birmingham Catalogue, R.A. 21h. 37m. 6s., Decl. + 53° 49′ (1890), was observed in the spring as 7·5–8·0 magnitude, but on November 15 was only of the ninth magnitude. The star is very red, with a magnificent spectrum of the third type (Group II.).

MATABELELAND.

AT the meeting of the Royal Geographical Society on Monday evening, Lieutenant E. A. Maund read a paper on Matabele and Mashona Lands. Mr. Maund was with Sir Charles Warren in South Africa in 1885, when he traversed and reported on Matabeleland. Since then he has spent much time in the country, accompanying Lobengula's two envoys to England about two years ago. He has thus had exceptional opportunities of observing both country and people, and moreover has had access to the official reports of Colonel Pennefather, the leader of the Pioneer Expedition into Mashonaland. After some introductory remarks, Mr. Maund proceeded to give a description of the country:—

"The physical features noticeable in Bechuanaland extend to the high veldt plateau of the Matopo Range, formed by vast sand-belts running east and west, varying in breadth from a few thousand yards to 50 miles, and in elevation, the crest above the trough, from a few feet to several hundred. These belts carry good grass and bush with camel-thorn trees, the bush being invariably thickest on the crest, but necessarily lacking a surface water-supply. This marked feature extends, with a few accidental variations caused by the outcropping of granite, limestone, and basaltic hills, probably from Namaqualand and Damaraland on the west to the Basuto Transvaal and Mashona Mountains on the east, and beyond the Zambezi northwards.

"The cause of these mysterious sand-belts suggests a problem in physical geography which must be left to geology to decide. They must have been raised in their present wave-like formation either by the aid of water or by a constant and powerful wind. The theory that this part of Africa was an elevated basin, which has gradually drained Zambeziward, is the most acceptable, as in the greatest depression about Lake Ngami and along the fertile valley of the Chobe there is still abundance of water. The continual washing backward and forward of the water has disintegrated the old red sandstone upper crust, and left the red sand in this formation like, on a small scale, the sand-ridges left on our sea-shore by the receding tide; while the kopjes of granite, which all have one form, stand out like rocks at low water.

"These kopjes are rocky hills, with the summits apparently denuded, leaving a flat table-top with short cliff-like edge, the *débris* having fallen in slopes at an angle of 45°, as though crumbled off as the tide fell. Beneath the sand formation is generally to be found a limestone sedimentary crust, which in the Kalahari undoubtedly preserves the water underneath from evaporation. Thus at a fountain near Vryburg, between Motito and Takoon, 20 feet beneath the surface there is a running stream 57 feet deep, doing no good to the soil, simply because it wants man, aided by science, to prevent its thus running to waste. The sandstone conglomerates at Kanje and Molopolali, and the banket formation in Matabeleland, were possibly formed by infiltration during this water age. The results of its energetic action is seen in the Matopo range, where you find hills formed of a single block of granite, looking in the distance like our Downs, but on closer inspection this gentle slope is rounded off and polished by the action of the sand-laden water. Detrition has made it as smooth as the shingle-pebbles on our shores. These hills are a favourite haunt of baboons, as immediately they are disturbed they scamper over the steepest and roundest hills, where you cannot follow them. There is apparently no glacial action, but *moulins* I have frequently found of all sizes in the smooth surface, often with the rounded boulder *in situ*. Indeed, for a long time, until I found them large and the boulder there, I had taken them for old Mashona mills, either for crushing corn or quartz, and subsequently I found these people do utilize the smaller for the former purpose. Geologists now by a closer examination will doubtless come across fossils in the limestone crust and sand, which will decide the question as to there having been a large lake since dried up, or one gradually run off, owing to a breach having been made through the outer rim by some convulsion where the Zambezi now flows out. This lake theory was a favourite speculation of Livingstone.

"With regard to the vegetation being thickest on the crest of the belts, I can only suggest that whatever moisture falls quickly finds its way to the valleys; consequently the grass grows more luxuriantly there. The grass in these valleys, after good rains, is often 4 to 6 feet high, and, as the natives yearly burn the grass when it is driest, it naturally follows that the fire is fiercest in the bottoms than over the crest, where grass is sparse from lack of moisture. Bush and trees perish in the dells, but live through the ordeal above, and often ultimately become so thick as to be impenetrable. It is on the high veldt among the Mashona hills that the rich reefs lie, once so well worth working in prehistoric times, as is evidenced by the old workings to be found all over the country; while the rich watered valleys, from whose streams the natives now wash their quills-full of gold, are capable of raising crops and feeding cattle for the support of a large European population.

"Before going into details I would draw your attention to the map of Matabeleland and Mashonaland. It practically lies between the parallels of 16° and 22° S. lat. and the meridian of 27° to 23° E. long., and is certainly the most promising country for colonization in South Africa. Compared with the country south of it, Matabeleland is like Canaan after the wilderness; lying high, generally healthy, and very rich in minerals—gold, copper, and iron having been extensively worked by the ancients with their rude appliances. Its numerous rivers are either running, or have plenty of water in them. The soil is rich and admirably adapted for corn; cattle thrive, and there is an abundance of grass and wood. White children can be reared in the country, which is a *sine quâ non* if it is to be successfully colonized by white men; and, above all, it is sparsely populated.

"The country dominated by the Matabele is nearly as large as Germany, while the territory actually occupied by them is very small, and would compare about as Bavaria does to the German Empire. Their kraals occupy the plateau forming the watershed between the Zambezi and the Crocodile Rivers. They are a Zulu military organization, occupying a rich country which they have depopulated, and live under a despotism of the worst kind. The population may be estimated at about 150,000, and it has become a mixed people of Zulus, Bechuanas, Mashonas, and Makalakas from the incorporation of conquered elements. Their fighting strength is probably not over 14,000 to 15,000 men."

After referring to the history of the Matabele, and to King Lobengula, and giving some account of the visit of the envoys to England, Mr. Maund went on to speak of the country which has just been opened up by the Pioneer Force.

"The country about to be opened up for colonization is," he stated, "an extensive plateau, on the water-parting between the Zambezi and the Crocodile Rivers. There are no mountain peaks. To the east the slope of the land is abrupt and the country broken, many of the hills isolated and very conspicuous, while to the north-west it falls in gentle undulations. The plateau is furrowed by many considerable rivers, and their numerous tributaries. The climate in these highlands, which vary from 3000 to 5000 feet above sea-level, is far more healthy than the now well-colonized sea-board of South Africa. The seasons are well marked, and the rainfall good. For eight months, from April to November, the air is particularly dry and salubrious, and compares well with the Free State. During and just after the rains one must be careful, as in all tropical climates. But, with proper precautions, dwellings placed high, and above exhalations from the marshes left by the subsiding rivers, and above all a judicious abstinence from alcoholic drinks, the new mining and farming communities will be as healthy as are the missionaries who have lived so long there with their families.

"Here let me pay a tribute to these silent workers, whose genial hospitality and kindly attention in case of sickness is bestowed on travellers throughout Africa. In Matabeleland as elsewhere they have been the pioneers of civilization. A heartbreaking up-hill work has theirs been for the past five-and-twenty years among the truculent Matabele, and though their converts are few, their example is beneficial to whites and blacks alike. They have built comfortable brick houses, laid on water from brooks and springs, and irrigated gardens which show the capabilities of the soil. The King, it is true, is the only one at present who dares copy them: he has a large commodious brick house put up by their builder; he has too an irrigated garden after their pattern. Now, let us hope, their harvest will come, for with the advent of a white population the old order of things will quickly change in Matabeleland. The example of their health will also be an incentive to our countrymen to house themselves as quickly as possible, or we shall have direful stories of fever, simply resulting from a lack of those comforts to which they have been used, and which up here will be a necessity.

"During the last rainy season, in the months of November, December, January, and February, the rainfall in the neighbourhood of Baluwayo amounted to upwards of forty inches. Like all tropical rains they are not continuous, but come in terrifically heavy thunderstorms with hot sunshine between. At this time the King is very busy with his witch doctors, rain-making; often painted with medicine charms in bands like a tiger, or making a dreadful concoction, called by the traders 'hell broth,' to please his credulous people, who come to beg rain for their gardens.

"The months of September and October, before the rains, are the hottest in the year. All vegetation appears dried up, and the grass lands are burned off by the natives. Cattle grow thin, and are sent off low down the rivers to find grass and water. The natives have, of course, no knowledge of how to store their generous rainfall. In September I have registered a maximum in the shade ranging between 105° and 111° F., but the atmosphere is so dry that it is more easily supported than 85° near the sea-coast, where the air is saturated with moisture. The evenings and mornings are delightful, and on this high ground the heat is never enervating. During the winter months, May, June, and July, it is very cold at night in these highlands. Even on the Macloutsie River, at an elevation of 2500 feet, I have registered 15° of frost at night, with the thermometer ranging up to 80° in the day (observed with instruments registered at Kew). Mealies—that is, Indian corn—put in soak for the horses over night, have been frozen hard in the morning.

"Notwithstanding this great variation in temperature, the dry season is particularly healthy. What, however, braces the white man withers up the unclothed native. Trek oxen suffer too from this cold, and the dryness of the grass. By these remarks I wish to convey the fact that with ordinary care this country is admirably adapted to colonization by us Anglo-Saxons. Englishmen have lived up there for the last twenty years, and, what is more essential, traders and missionaries have reared large families. There is not the necessity for sending them home as with Indian children. Neither need men, as on the west coast, return home periodically, in order to recruit. Here they may make a permanent home."

After speaking of the immense agricultural capabilities of the country and of its mineral riches, Mr. Maund gave some account of the particular district through which the Pioneer Force passed:—

"Passing out of Khama's country, the B. S. A. Company's expedition found a fair agricultural country, rising only 500 feet in the 150 miles between the Tuli and Lundi. The former river is 400 yards wide at the drift. Half a dozen new rivers, whose euphonious names I need not trouble you with, are reported as running south-east to the Crocodile. At first the road led through a bush and mopani veldt, while the latter 90 miles consists of grazing flats interspersed with granite and sandstone kopjes. It is sparsely populated by Makalakas and Banyai, who are tributary to Lobengula.

"After the Lundi, the elevation gets sharper and the country more difficult; there is a rise of 1500 feet in less than 65 miles to the top of the Providential Pass, the only apparent pass (and that 8 miles long) leading from the low to the high veldt. At the Inkwe (? Tokwe) the height above sea-level is 2700 feet. This is a rapid river with water 50 yards wide and 3 feet deep, even in the dry season. The formation here changes from granite to slate, and the gold indications are very good. We are now among the ancient workings of Benmatapa, Monomotapa, or Quiteve. Twelve miles east in the mountains are the grand ruins of its ancient capital, Zimbabye, or Zimboe.

The many and vast remains of ancient buildings all point, from their propinquity to old workings, to an extensive gold industry, when the means of extraction were crude as compared with modern appliances. The country gradually rises into an undulating plateau ranging from 4530 to 5000 feet above sea-level, with park-like scenery, the eastern edge breaking away into rocky gorges, supplying many tributaries to the Sabi. The water shed between this river and the Zambezi's tributaries is often very narrow ; 100 yards would sometimes only separate the streams running to the two basins. There are apparently no inhabitants on this plateau south of the Hanyani, so cruelly have Matabele assegais done their work.

"The bush is thick and the land boggy at the head waters of these rivers, but beyond the Umfuli there are plains from which Mount Hampden rises, stretching away to the head waters of the Mazoe. The neighbourhood of Fort Salisbury is well wooded, and the petty tribal chiefs welcomed the English force, as promising them security. Prospectors are reporting favourably from all directions, and find old workings wherever they go."

Mr. Maund concluded by referring to the famous Zimbabye ruins, which he seems inclined to think are Phœnician, or at least early Arabian. But Mr. Theodore Bent, who spoke after the reading of the paper, was strongly of opinion that they are of Persian origin.

THE CONFERENCE OF DELEGATES OF CORRESPONDING SOCIETIES OF THE BRITISH ASSOCIATION.[1]

AT the first Conference, held on September 4, the chair was taken by Mr. G. J. Symons, F.R.S. The Report of the Corresponding Societies Committee was taken as read. Subjects of interest to the Corresponding Societies were then discussed in the order of the Sections of the Association.

SECTION A.

Temperature Variation in Lakes, Rivers, and Estuaries.—The Chairman stated that many thermometers had been distributed, and much information had been collected during the year.

Mr. W. Watts stated that he had been conducting temperature observations in two large reservoirs belonging to the Oldham Corporation, the results of which were included in the Report of the Committee.

Mr. Cushing presented a report of weekly temperature observations taken in the River Wandle, in Surrey. The temperatures were taken between 3 and 3.30 p.m. on Sunday afternoons, and extended from October 1888 to February 1889. The observations were taken at ten different stations. The records were accompanied by a statement of the mean weekly shade-temperature, and the rainfall for the previous week. The observer, Mr. F. C. Bayard, was willing to continue the work.

The Chairman stated that he had recently been reducing experiments on evaporation which had been made for several years at Strathfield Turgiss, in Hampshire, in which the ordinary small evaporators had been compared with a tank 6 feet square and 2 feet deep. Evaporation from the tank averaged 15 inches per annum, while the smaller evaporators (owing to the high temperature of the water) indicated considerably in excess of the truth.

Meteorological Photography.—Mr. Hopkinson alluded to the success which had been achieved by the Committee on Geological Photography, and pointed out the growing importance of photography in other branches of scientific research. He then suggested the appointment of a Committee on Meteorological Photography. Photography, he said, could most advantageously be applied to the investigation of meteorological phenomena, such as the forms of clouds, lightning-flashes, and the effects of storms. The Committee would collect the photographs and keep a register of them. The study of the forms of clouds would be more satisfactory if undertaken by a comparison of photographs than of drawings ; methods of overcoming the difficulty of photographing light clouds in a blue sky might be investigated ; and the various phenomena connected with lightning-flashes would be a most interesting field for research. Photographs showing the effects of storms should be secured as soon as possible. If a Committee were formed, Mr. Symons and Prof. Meldola would consent to serve on it, and Mr. A. W. Clayden would be willing to act as Secretary.

After some discussion, it was decided that application should be made through the Committee of Section A for the formation of a Committee on Meteorological Photography, and that the application should be supported by a recommendation from the Conference of Delegates.

SECTION C.

Sea-coast Erosion.—Mr. Topley asked assistance for the Committee investigating this matter.

Erratic Blocks.—The Rev. E. P. Knubley stated that the Yorkshire Naturalists' Union had been recording erratic blocks satisfactorily ; twenty-five reports had been presented.

Geological Photography.—Mr. O. W. Jeffs stated that, through the action of the Conference of Delegates at the previous meeting of the Association, a Committee had been appointed for collecting and reporting on geological photographs. Much assistance had been rendered to this Committee by delegates from the Corresponding Societies, many of whom had sent photographs, or lists of those that had been taken. The photographs had been arranged in order to select those which illustrated well-defined strata or sections. The Report showed that many of the counties of England and Wales were as yet unrepresented, and he asked those delegates who had not yet done so to bring the matter before their Societies, and to interest photographers in the work. The object of the Committee was to secure a series of photographs illustrating the features which geologists thought best worth recording in their respective localities. The counties from which photographs had been received were : Dorsetshire, Cornwall, Devonshire, Isle of Man, Kent, Lancashire, Montgomeryshire, Nottinghamshire, Suffolk, Shropshire, and Yorkshire ; there were also a few from North Wales, Scotland, and Ireland. The Yorkshire Naturalists' Union had contributed over 100. A large number of the photographs were exhibited in the room of Section C.

Prof. Bonney testified to the zeal and energy of Mr. Jeffs as Secretary to the Committee, and suggested that, when a large collection of photographs had accumulated, some of the more typical examples of geological phenomena might be enlarged for publication.

Mr. Jeffs suggested that the Committee might make arrangements with some photographer for preparing lantern-slides from the photographs for the purpose of illustrating lectures.

Mr. Wm. Gray thought that it would be an advantage if each delegate were appointed the local representative of the Committee in his own district, and authorized to collect the photographs ; he would be willing to act in this capacity for the north of Ireland.

Prof. Meldola pointed out that, in taking photographs of geological sections, in which differences in the strata were often indicated only by small differences in colour, it would be an advantage to use orthochromatic plates.

The desirability was then discussed of adopting some means by which members of the British Association, and those who assisted in the work, might be enabled to procure copies of the photographs, either as lantern-slides, prints, or enlargements, and various suggestions to this end were made.

SECTION D.

Disappearance of Native Plants.—Prof. Hillhouse stated that the third Report of the Committee on this subject had been confined to the north of England, the Isle of Man, and to a few records from South Wales. The bulk of the material had been obtained directly by correspondence with the local Natural History Societies, especially the Yorkshire Naturalists' Union. Next year's Report would probably deal with the whole of Wales, and possibly adjoining counties and the south-west of England. He then gave a *résumé* of the Report, stating that it contained an account of the more or less complete disappearance from certain localities of about seventy species. In some cases the disappearance was due to natural causes, but in most to the action of man.

Mr. Hopkinson stated that nearly the whole of the ferns in his district (St. Albans) had disappeared within the last twenty years. He attributed this to London collectors and dealers, and added that there was danger of even the primrose being exterminated from the neighbourhood of London, as the roots were taken there by cartloads every year.

Mr. M. B. Slater suggested that the best plan to obtain rare plants for cultivation would be to procure a little ripe seed and

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[1] Abridged from the official Report which has recently been issued to the Corresponding Societies.